The Future of Electric Power in the South
Workshop, May 6th, 2014
Summary of Working Group Sessions
June 25, 2014

Session 1: Discussion of Scenarios. In the first session, each working group was asked to construct a prioritized set of scenarios. The group should then prioritize their selected scenarios according to overall importance, likelihood, and relevance to the FEPS project (focused on the role of PV and CHP). For purposes of this effort, the time horizons are 2020, 2030, and 2040, but the relative importance of near vs. long-term time horizons is up to the working groups to decide. To the extent possible, for each scenario, the working groups should also identify one or two key elements – scenario assumptions or projections to which the outcome is most sensitive – and provide greater detail on those points.

Session 2: Discussion of Strategies. In the second working group session on May 6, the groups were asked to discuss potential utility/stakeholder strategic approaches that may respond to particular scenarios or scenario combinations.

Working Group 1 – Economics (Chairs: Dr. Marilyn Brown and Erik Johnson, Assistants: Alex Smith and Yu Wang)

Session 1:
Our discussion began with a focus on the philosophy of modeling and forecasting energy systems. Members of the group advocated the use of scenario modeling to "stretch the limitations" of popular thinking regarding the future of electric power, rather than simply forecasting expected trends. Our group agreed that **it is more important to develop scenarios that involve "imperfect foresight" to show the potential impact of hard-to-predict "disturbances" or sudden changes in trends affecting electric power systems.** The group suggested that one way to do this would be to model a given scenario for the entire forecast period, then to begin an alternate forecast with very different parameters (say, a surge in demand or a rapid increase in natural gas prices) with a start-date in the middle of the forecast period.

Our group then turned to the creation of scenarios of interest. We agreed that some scenario involving a **natural disaster or weather-related event** would be useful, as such disturbances are expected to be more likely and more severe in the future. Hurricanes, droughts, and floods were all listed as worthy weather-driven disturbances. Two additional scenarios of interest were **(1) a high electricity demand, high economic growth scenario, and (2) a low electricity demand, low economic growth scenario**. Each of these scenarios was then to receive its own "shock" scenario – that is, a sudden change in trend. For example, the low-electricity-demand, low-economic-growth scenario might suddenly be reversed midway by a surge in energy needs for datacenters or demand growth from migration into the Southeast. These "shock scenarios" formed an additional two scenarios, bringing the total count to at least five.

Session 2:
We then discussed strategies for coping with each possible scenario. The discussion centered on understanding the task at hand, in terms of how a "best" strategy might be defined and "for whom" such a strategy might be best. These were challenging questions that occupied the group's attention for some time. Moreover, it was pointed out that some actors might employ all of the strategies listed on the worksheet, and even might already be doing so. To many members of our group, the tradeoffs between strategies appeared unclear. Also there was some brief discussion over the drivers of combined heat and power (CHP) systems, particularly regarding natural gas prices.

Several members of our group agreed that developing novel policy tools to deal with resilience of power systems would be very valuable. There appears to be a shortage of such tools, which for example would be capable of **identifying low-cost means to improving power system resilience**; the example of the difference in costs between "resilient PV" and conventional PV was offered, with the suggestion that modeling the costs of resiliency-enhanced power system components would be an interesting direction for this research to take. A final takeaway offered was that further iterations of existing modeling tools might not be helpful, while novel policy tools to tackle such issues as grid resilience would be useful.

Participants: Marilyn Brown, Eric Johnson, Alex Smith, Anup Shah, Ben Hill, Charles Huling, Charles Rossmann, Clark Seydel, Etan Gumerman, Gary Garrett, Ken Ostrowski, Peter Evans, Peter Marte, Yu Wang, Jans Vrinis, Jeffrey Roark

Working Group II: Policy (Chair: Dr. Valerie Thomas, Assistants: Matt Cox and Ben Staver)

Session 1:
Working Group II suggests modeling three policy scenarios; however, these may actually total six or seven scenarios. These are presented below, starting with perhaps the riskiest option, and moving towards scenarios the group felt were more responsible:

- A future with high levels of distributed, low-carbon generation, and a new role for utilities as grid managers
- A future with a focus on demand-side management and energy efficiency, with some renewables, but maintaining central generation as a key backbone of the system
- Akin to a reference case scenario, where the South continues to go as it has historically.

Alternative approaches could be characterized by the type of market or policy interventions:

- Interventions in the energy market are reduced; the market is more free to choose the most cost-effective means of meeting demand
- The EIA AEO reference case
- Include regular updates to federal energy and environmental standards where history may provide a guide as to the periodicity of such changes

- Utilities in the South are decoupled (fixed costs separated from variable costs), and carbon mitigation becomes a strong goal.

Participants suggested that the Clean Air Act, particularly Section 111(d), will be a major driver of electric utility decisions over the course of the next several years. State implementation strategies for 111(d) will therefore play a big role as well. If energy efficiency counts towards the carbon reduction goals in the SIPs, then there could be a big expansion of efficiency efforts, spearheaded by utility companies. EERS or RPS were discussed as policies that would naturally grow in attractiveness depending on the SIP process. Natural gas was another means of meeting 111(d) requirements discussed, along with potential new fracking regulations and the intention to open exports for LNG, which may also involve plenty of interactions at the state level. Natural gas is viewed as driving renewables out of the marketplace today.

Other federal policy items, like MATS, NAAQS, and the Clean Water Act, will also play significant roles, and are less likely to be embroiled in the judicial system. NERC and FERC are viewed as having roles in driving technology and cost, respectively. No new nuclear policies are anticipated.

Maintaining low cost, reliable power is a key policy driver to take into account in modeling scenarios (characterized as nuclear electricity generating units, CCS, and high NG deployment, which will enable economic development). Reliability should be separated from low cost, although it tends to not be in expert conversations. The second-highest rated driver is cleaner power (RPS/DG, third-party financing options). CHP is viewed as requiring heavy levels of government investment or regulatory requirements in order to come online; its long payback period and riskiness contributes to being viewed as a poor option to meeting clean or low cost goals. The group heavily favors solar PV over CHP for these reasons. Opinion at the table was split on the question as to whether companies actually want to be more environmentally aware, or whether they simply desire the public relations benefits of such a reputation – a better understanding on this question may change the favorability of different approaches and drivers in the South.

Specific policies that might be included in particular policy scenarios may include:

- **Section 111(d)** – federal and state EERS, RPS, Benchmarking, carbon pricing (although unlikely)
- **Standards** – Electric vehicles, building codes, CAFÉ
- **Financing options** – clean energy development banks, loan guarantees, loan funds, grants, tax credits, etc.
- **Reducing solar soft costs**, such as permitting fees

Other Session I Items:
Smart Grid – enable green button approaches, where third-party entities can access energy data and find cost-savings in the commercial building stock. This is done better by third parties than by utilities due to their specialized expertise. Smart grids were discussed as a necessary enabler.

Interactions between utility developments and water access should be more regular. PUCs could be tasked with also reviewing water availability in utility applications.

Session 2:
All scenarios received some amount of general acceptance that they would be interesting to model. Having a diverse energy supply is generally preferred by all. Utilities could be operating spinoffs like SunRun; Duke has already started one, and maybe other utilities in the region could begin one in their territories.

Participants:
John Sibley, Judy Adler, Bryan Myers, Edens Davis, Dan Matisoff, Joe Hoagland, Tim Leuwen, Shemetha Jones, Jennette Gayer, David Gipson, Mandy Mahoney

Working Group 3- Technology (Chair: Dr. John Crittenden, Assistants: Xiaojing Sun and Jean-Ann James)

Session 1:
Game Changing Technologies (Highly Recommended). Utility scale solar power and distributed solar power are seen as key components of the unavoidable path forward. The group highly recommended that more attention should be given to integrated/integrative grid that can take the advantage of a suite of technologies that are complementary in nature, including **CHP and solar PV**.

In a similar vein, concern about grid stability and reliability after adding large amount of distributed generation, the group also highly recommend **interactive control technology** that allow grid operator and even distributed generators to manage their load, electricity generation and dispatch more timely and efficiently.

Inexpensive storage technologies that can be used in combination with distributed generation technologies like solar are also highly recommended by the group. A few types of storage technologies were discussed: battery pack; chill water; ice storage/ phase change, etc.
Smart inverters are also suggested as a key technology to improve the stability of solar electricity, allowing solar PV owner to manage their electricity generation better.

Technologies with good potentials (Recommended)

- A massive uptake of electric vehicle adoption, although the water constraint on the centralized electricity generation system could present a bottleneck to large scale EV adoption.
- Smart grid
- Micro-grid technologies
- Modular plug-in-play CHP for the residential sector. This technology faces the challenge of matching the thermal load.

Recommended Technology Scenarios

The group recommends a scenario with aggressive renewable energy penetration up to 40%, among which distributed generation accounts for a large portion. Under such aggressive scenario, the solar PV cost would follow closely to DOE's SunShot program cost trajectory. The cost of CHP would decline by 20% under this scenario, driven by economies of scale adoption and the removal of non-technical barriers.

A moderate scenario would incur less rapid PV cost reduction, i.e., only the costs of hardware would drop; the reduction of soft cost would be smaller.

Session 2:
Recommended Strategies:
Real time pricing/time of use pricing. Move towards policies that rationalize retail prices according to the real cost of generation. Such strategy incentivizes conservation and maximizes efficiency. Another good approach is to provide the consumers with more information so that they can manage their electricity consumption smartly.

Climate adaptation. **Increase the grid's resilience/reliability under severe weather events**. It may require changes to existing regulations to allow third party entrants, and RPSs. It also requires an integration of regulation and infrastructure planning, as well as integration with natural gas, IT, and telecommunication infrastructure. Under this strategy, the energy-water nexus will also be an important factor, considering both the electric grid's demand for water and climate change's impact on water resources, especially given the fact that many southern states are already constrained by water resource.

Change the fuel mix of the grid through diversifying resources and increasing the role played by energy efficiency. It requires a new business model for the utility companies that welcomes more unconventional fuels such as PV, CHP, and energy efficiency, as well as natural gas, nuclear, CCS. It should also allow flexible ways to achieve fuel diversity, such as interstate renewable energy credits (RECs) trading. An ISO or a RTO system would facilitate such transition.

Participants:
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